

***Isohypsibius granditintinus*, a New Psammobenthic Tardigrade from an Estuary of South Korea**

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ABSTRACT

Isohypsibius granditintinus, a new tardigrade species of genus *Isohypsibius*, collected from the sand bottom of the estuary of Taejongchŏn River, Kyŏngju, is described. the present new species differs from its congeners in having the combination of the following characters: smooth cuticles; three macroplacoids; absence of microplacoid, lunule and cuticular bar; very elongate external claws with two accessory points.

Key words: Taxonomy, description, Tardigrada, Hypsibiidae, *Isohypsibius granditintinus*, new species, estuary, Korea

INTRODUCTION

Isohypsibius Thulin, 1928 is the largest genus of family Hypsibiidae, containing about 116 nominated species which were found mainly between mosses or in littorals of various freshwater bodies including interstitial waters. (Ramazzotti and Maucci, 1983; McInnes, 1994).

In Korea, seven species and a subspecies have so far been reported. From mosses in North Korea, *Isohypsibius sattleri* (Richters), *I. granulifer koreanensis* (Iharos), *I. augusti* (Murray), and *I. schaudinni* (Richters) were first reported by Iharos (1971), then *I. schaudinni* (Richters) and *I. tuberculatus* (Plate) by Dastych (1974). Following them, in South Korea *I. tetradactyloides* (Richters) was recorded from terrestrial mosses at Pŏmŏsa temple, Pusan and Taehŭksando I. by Moon and Kim (1988). Besides, two more species were added to Korean fauna from freshwater littorals, that is, *I. granulifer* Thulin from a pond in Kangwŏn National University, Ch'unch'ŏn (Moon, Kim and Chang, 1989) and from Upo-nup swamp (Moon, 1992), and then *I. monoicus* Bertolani from a pond at Sŏgwip'o, Cheju I. and Yŏngrangho lake, Sokch'o (Moon, 1992).

In this paper, we describe a new species of *Isohypsibius* which was found at the sand bottom of the estuary of Taejongch'ŏn River, Kyŏngju.

MATERIAL AND METHODS

Material was collected from the upper 10 cm of littoral sediments or sands at the estuary of Taejongch'ŏn River, Kyŏngju (35°44' 26"N, 129°29' 07"E), where the bottom salinity fluctuates from 0.2‰ to 3.2‰ in the time span February, 1995 - September, 1996. Samples were dredged into polyethylene plastic bag by skin divers, then at the laboratory were extracted by the anaesthetization (using $MgCl_2$)-decantation technique (Hulings and Gray, 1971).

Specimens were drawn and measured in lactophenol on Cobb's aluminium hole slide, and also observed and photographed under differential interference microscope. Figures were made with the aid of a drawing tube. The SEM material was fixed with hot (about 80°C) ethanol immediately after extraction, and fixed again for overnight at 4°C in a 2.5% glutaraldehyde, then followed by postfixation with 1% cold osmium tetroxide. After dehydration through a graded series of ethanol (50%, 60%, 70%, 80%, 90%, 100%, 100%) for 30 minutes each, the material was critical point dried, and coated with gold-palladium in a high evaporator, and then examined in a Hitachi S-520 scanning electron microscope operated at 20 kV.

DESCRIPTION

Class Eutardigrada Marcus, 1927

Order Parachela Schuster, Nelson, Grigarick & Christenberry, 1980

Family Hypsibiidae Pilato, 1969

Subfamily Hypsibiinae Pilato, 1969

Genus *Isohypsibius* Thulin, 1928

***Isohypsibius granditintinus* sp. nov. (Figs. 1-2)**

Type specimens. 9 individuals, Taejongch'ŏn River, Kyŏngju (salinity 1.8‰), February 11, 1995, C.Y. Chang leg. All are mounted in lactophenol on Cobb's aluminium hole slide. Holotype and three paratypes will be deposited in the U. S. National Museum of Natural History, Smithsonian Institution.

Additional material examined. 3 individuals, collection site same as type locality (water temperature 21.8°C, pH 9.3, salinity 0.2‰-0.6‰), May 15, 1996, C.Y. Chang and H.S. Rho leg. Specimens are gold-coated on the aluminium stub for SEM; 3 individuals, same as type locality (water temperature 23°C, salinity 0.9‰-2.3‰), September 23, 1996, C.Y. Chang and H.S. Rho leg. Specimens are gold-coated on the aluminium stub for SEM.

Diagnosis. Cuticle smooth; with 3 rod-shaped macroplacoids; microplacoid absent; very elongate external claws with 2 accessory points.

Holotype. Length up to 430 μ m. Body plump and yellowish. Eye spots absent. Cuticle completely smooth. Mouth in a front-ventral position, without peribuccal lobes; width of mouth opening 6 μ m. Internal diameter of buccal tube 3 μ m at the stylet support insertion site and 30 μ m long from mouth

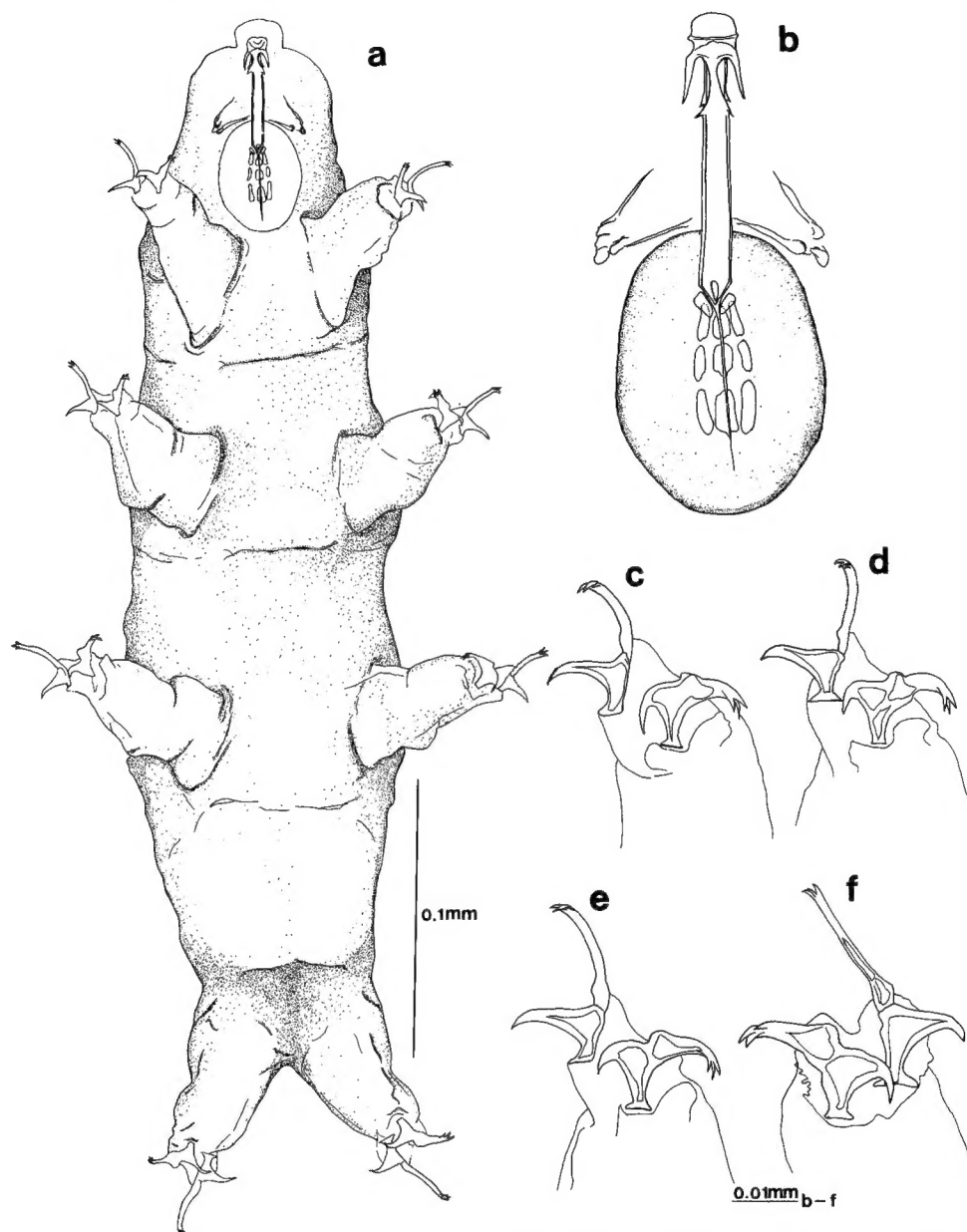


Fig. 1. *Isohypsibius granditintinus*, n. sp.: a, habitus, ventral view; b, bucco-pharyngeal apparatus; c, claws on leg I; d, claws on leg II; e, claws on leg III; f, claws on leg IV.

to point of entry to pharyngeal bulb. Stylet support present. Pharyngeal bulb oval (length $39\ \mu\text{m}$, width $29\ \mu\text{m}$, length to width ratio 1.34) containing 3 large rod-shaped macroplacoids: first macroplacoid ($5\ \mu\text{m}$ long) with a very slight subterminal constriction, second ($4\ \mu\text{m}$) with a slight subterminal constriction, third ($6\ \mu\text{m}$) slightly constricted in its middle; size arrangement of macroplacoids $\text{III} > \text{I} > \text{II}$ ($\text{I} : \text{II} : \text{III} = 0.8 : 0.7 : 1$). Microplacoid lacking. Pharyngeal bulb aligned with macroplacoids at the end of the buccal tube.

Legs of medium size with 'Isohypsibius type' claws: Double claws each on legs I-IV, external claw

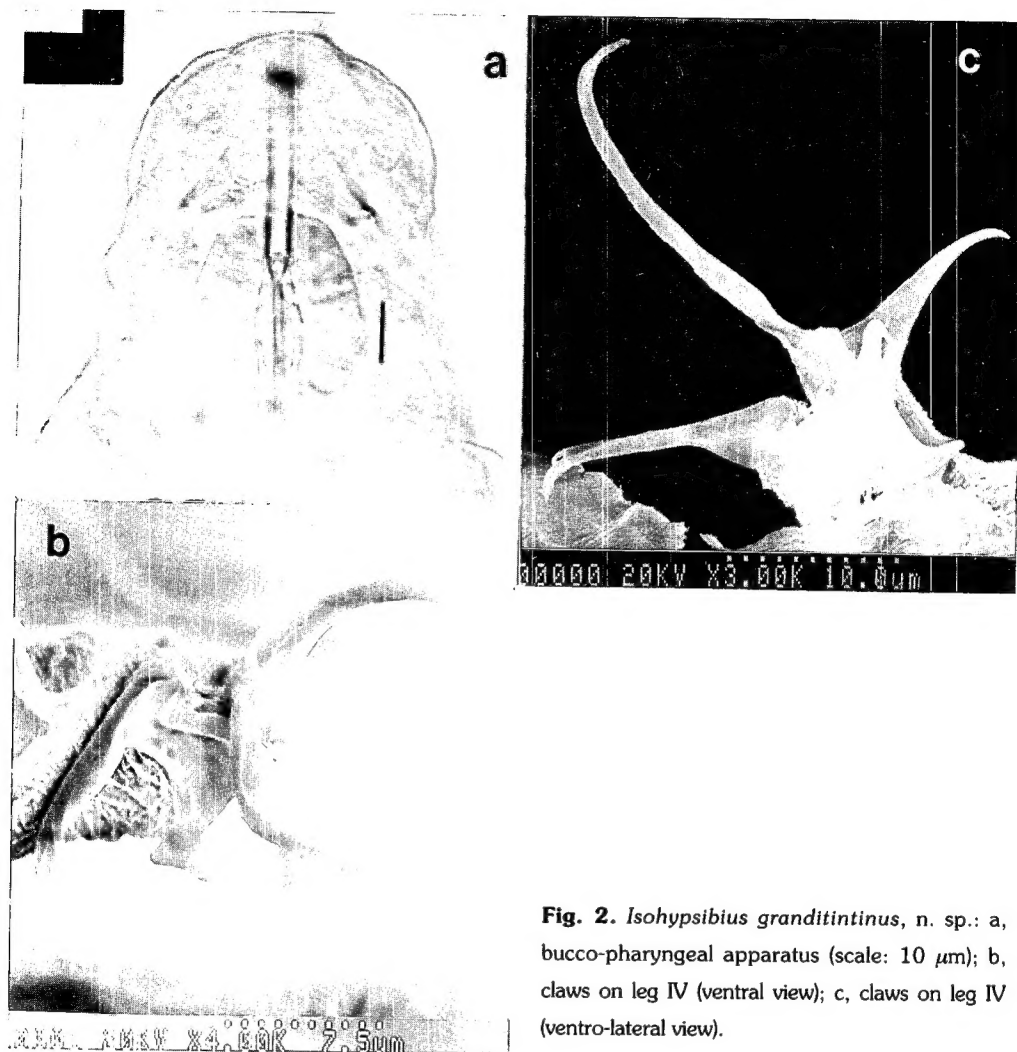


Fig. 2. *Isohypsibius granditintinus*, n. sp.: a, bucco-pharyngeal apparatus (scale: 10 μ m); b, claws on leg IV (ventral view); c, claws on leg IV (ventro-lateral view).

and internal one different in size, with claw sequence 2-1-2-1 (secondary-primary-secondary-primary). Primary branch of each claw much elongated, especially at external claw of leg IV (length ratios of primary branch to secondary one on external claw of leg I-IV 2.24, 2.44, 1.98, 3.67 respectively) with 2 accessory points at apical part of lateral margin. Examined under scanning electron microscope, tip of claw and 2 accessory points forming paddle (webbed), but shapes of external claw and internal one different a little each other, as shown in Figs. 2b-c. Primary branch on external claw of each leg pair diverging from secondary one with an right angle or more. Length of external claw of leg IV 31 μ m with its main branch 25 μ m long, and its base 6 μ m high. Basal branch in expansion. All claws lacking lunule and cuticular bar. Eggs unknown.

Measurements and Variations. All the type specimens were supposed to be fully grown. All the specimens examined have no any cuticular ornamentation, and bear webbed claws as in Figs. 2b-c. Measurements from nine type specimens examined are shown in Table 1. The size arrangement of 3 rod-shaped macroplacoids (III > I > II, I : II : III = 0.8 : 0.7 : 1) and the length to width ratio of pharyngeal bulb (mean of 1.29) show rather high consistency. Eyespots are present in all paratypes.

Table 1. Measurements (units in μm).

characters	specimens	paratype								mean
		1	2	3	4	5	6	7	8	
body length		430	253	286	232	288	286	295	282	295
body width		98	73	107	60	71	82	96	92	76
length of buccal tube		23	20	26.6	18.7	24.5	23.1	23.8	20.8	22.6
length/width ratio of pharyngeal bulb		1.34 39/29	1.29 31/24	1.27 42/33	1.30 30/23	1.32 33/25	1.36 30/22	1.30 35/27	1.30 39/30	1.29 36/28
macroplacoids I : II : III		5:4:6 0.8:0.7:1	4:3:4:4:6 0.8:0.7:1	5:9:5:7:5 0.8:0.7:1	4:9:3:6:5:5 0.9:0.7:1	5:2:4:6 0.9:0.7:1	4:3:3:4:7 0.9:0.7:1	5:2:4:1:6 0.9:0.7:1	5:4:5:7:2 0.7:0.6:1	5:4:1:6:2 0.8:0.7:1
length of external claw on leg IV		31.0	35.0	34.0	31.5	39.0	30.0	36.0	36.5	35.0

Table 2. Character comparisons between *Isohypsiobius granditintinus* n. sp. and its most resembling congeners.

Characters Species	shape of macroplacoid	size arrangement of macroplacoids	apophysis	lunule	cuticular bar	accessory points	habitat	distribution
<i>Isohypsiobius granditintinus</i> n. sp.	rod	III > I > II	present	absent	absent	present	brackishwater, psammo- benthic	Korea
<i>I. deconincki</i> Pilato, 1971	short	I > III > II	present	present	absent	absent	freshwater, interstitial	Italy, Ukraine, Africa
<i>I. hydrogogianus</i> Ito & Tagami, 1993	rod	III > I > II	present	present	present on leg I-III	absent	municipal water supply	Japan
<i>I. irregibilis</i> Biserov, 1992	rod	III > I > II	present	present	present on leg I-III	present	freshwater	Baikal Lake, Russia
<i>I. itoi</i> (Tsurusaki, 1980)	rod	I > III > II	present	absent	absent	absent	marine, interstitial	Japan
<i>I. kristenseni</i> Pilato, Catanzaro & Binda, 1989	rod	III > I > II	present	absent	absent	absent	freshwater	Sicily, Mozam- bique
<i>I. myrops</i> (Marcus, 1944)	slender rod	III > I > II	absent	absent	absent	present	freshwater	Brazil
<i>I. salturus</i> Schuster, Tofner & Grigarick, 1978	rod	I > III > II	present	present	absent	present	beach of lake	California
<i>I. tetractyloloides</i> (Richters, 1907)	short	III > I = II	present	absent	absent	present	freshwater or moss	cosmo- politan

Etymology. The specific name, *granditintinus* (*grandis*, L.: grand or magnificent; *tintinnabulum*, L.: bell) is taken from the name of the type locality, which means “Big-Bell River” in Korean. There is a legend that Mongolian invaders plundered a magnificent and huge bell of Shilla dynasty of ancient Korea, but their ship with the bell was submerged at the estuary of this river.

Remarks. The genus *Isohypsibius* Thulin, 1928 comprises 116 species, which can be easily divided into two groups by their cuticular ornamentation. The present new species, which belongs to minor group not bearing gibbosities or a sculptured cuticular pattern, is most similar to the eight species of its congeners in having the pharyngeal apparatus with three macroplacoids and lack of microplacoid: *I. deconincki* Pilato, 1971, *I. hydrogogianus* Ito and Tagami, 1993, *I. irregibilis* Biserov, 1992, *I. itoi* (Tsurusaki, 1980), *I. kristenseni* Pilato, Catanzaro and Binda, 1989, *I. myrops* (Marcus, 1944), *I. saltursus* Schuster, Toftner and Grigarick, 1978, and *I. tetradactyloides* (Richters, 1907). As shown in Table 2, the present new species is distinguished from the species above in having the following character combinations: absence of lunule and cuticular bar; the shapes and arrangement of macroplacoids; much elongated external claws with two accessory points; the habitat preference of brackishwater sand bottom.

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대종천 河口的 모래틈에서 채집한 *Isohypsibius*속의 완보류 1신종

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요 약

경북 경주시 양북면 대본리 대종천 하구 汽水域의 모래틈에서 眞緩步類 1신종, *Isohypsibius granditintinus*(Hypsibiidae科)가 채집되어 기재한다. 본 신종은 殼皮에 과립형 돌기가 배열하지 않는 무리에 속하는, 咽頭球의 macroplacoids의 수가 3개이고 microplacoid가 없는 점, lunule과 cuticular bar가 없고 곁가시를 가진 바깥쪽 발톱이 매우 伸張되어 있는 점 등의 형질조합이 *Isohypsibius*속 내의 여타 유사종들의 경우와 뚜렷하게 다르다.